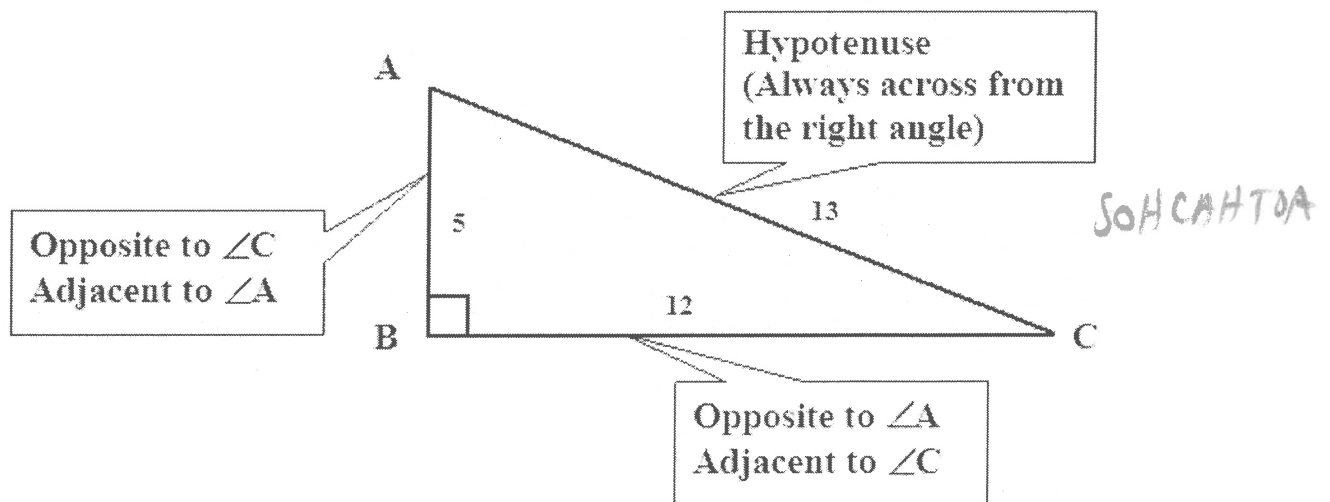


2.5 Using the Sine and Cosine Ratios to Calculate Lengths

LESSON FOCUS: Use the sine and cosine ratios to determine lengths indirectly.



The Sine Ratio

$$\underbrace{\sin \theta}_{\text{Ratio}} = \underbrace{\frac{\text{opp}}{\text{hyp}}}_{\text{Ratio}} = \frac{5}{13}$$

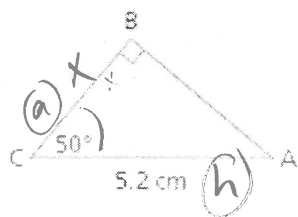
angle

The Cosine Ratio

$$\underbrace{\cos \theta}_{\text{Ratio}} = \underbrace{\frac{\text{adj}}{\text{hyp}}}_{\text{Ratio}} = \frac{12}{13}$$

angle

Example 1: Using the Sine or Cosine Ratio to Determine the Length of a Leg
Determine the length of BC to the nearest tenth of a centimetre.



$$\cos C = \frac{a}{h}$$

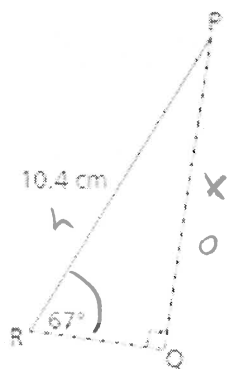
$$\cos 50 = \frac{x}{5.2}$$

$$x = 5.2 \cos 50$$

$$x \approx 3.3 \text{ cm}$$

CHECK YOUR UNDERSTANDING

Determine the length of PQ to the nearest tenth of a centimetre. [Answer: PQ \approx 9.6 cm]



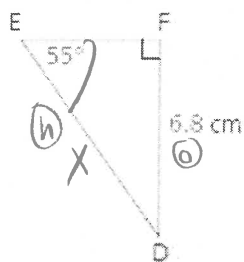
$$\sin R = \frac{p}{h}$$

$$\sin 67 = \frac{x}{10.4}$$

$$10.4 \sin 67 = x$$

$$9.6 = x$$

Example 2: Using Sine or Cosine to Determine the Length of the Hypotenuse
Determine the length of DE to the nearest tenth of a centimetre.



$$\sin E = \frac{p}{h}$$

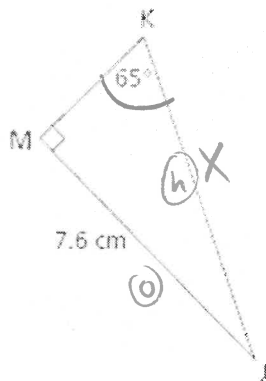
$$\sin 55 = \frac{6.8}{x}$$

$$x \sin 55 = 6.8$$

$$x = \frac{6.8}{\sin 55} = 8.3 \text{ cm}$$

CHECK YOUR UNDERSTANDING

Determine the length of JK to the nearest tenth of a centimetre. [Answer: JK \approx 8.4 cm]



$$\sin K = \frac{p}{h}$$

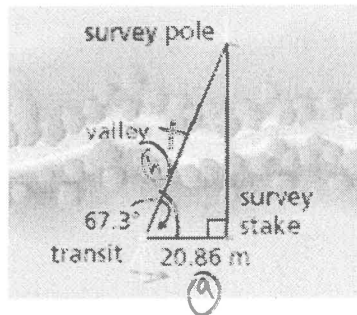
$$\sin 65 = \frac{7.6}{x}$$

$$x = \frac{7.6}{\sin 65}$$

$$x \approx 8.4 \text{ cm}$$

Example 3: Solving an Indirect Measurement Problem

A surveyor made the measurements shown in the diagram. How could the surveyor determine the distance from the transit to the survey pole to the nearest hundredth of a metre?



$$\cos \theta = \frac{a}{h}$$

$$\cos 67.3 = \frac{20.86}{x}$$

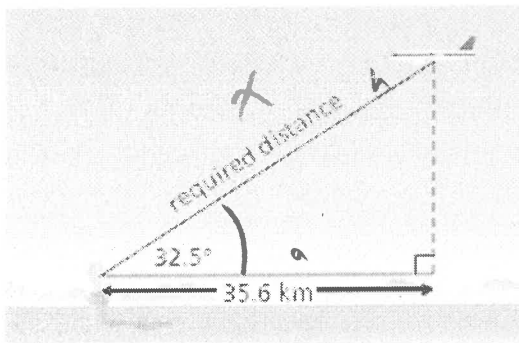
$$x \cos 67.3 = 20.86$$

$$x = \frac{20.86}{\cos 67.3}$$

$$x = 54.05 \text{ m}$$

CHECK YOUR UNDERSTANDING

From a radar station, the angle of elevation of an approaching airplane is 32.5° . The horizontal distance between the plane and the radar station is 35.6 km. How far is the plane from the radar station to the nearest tenth of a kilometre? [Answer: 42.2 km]



$$\cos \theta = \frac{a}{h}$$

$$\cos 32.5 = \frac{35.6}{h}$$

$$h = \frac{35.6}{\cos 32.5}$$

$$h = 42.2 \text{ km}$$

Homework: Page 101 #6-11, 12 a i
3a, 4a, 5a, 1